

REMARKS

Specification

Please amend the abstract with the following paragraph:

The present invention relates to a cobalt electroless plating bath composition ~~and method of using it for microelectronic device fabrication~~. In one embodiment, the present invention relates to cobalt electroless plating in the fabrication of interconnect structures in semiconductor devices.

Please amend the related US Application Data with the following paragraph:

The present patent application is a divisional of ~~Application No.: 10/025,033~~ Patent No. 6,645,567, filed December 19, 2001, ~~which is currently pending~~ and issued November 11, 2003.

Claim Objections

Claims 15, 17, and 19 are objected to under 37 CFR 1.75(C), as being improper dependent form for failing to further limit the subject matter of a previous claim. Claims 15, 17, and 19 have been amended such that they further limit the claims from which they depend. Applicant respectfully requests that examiner remove his objections to claims 15, 17, and 19.

Claim Rejections - 35 U.S.C. § 112

The Examiner has rejected claims 13–21 under 35 USC 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claim 13

Examiner has rejected claim 13 as indefinite and states that, “it is unclear whether the amount of P is permissibly zero or whether there must be a finite amount, but possibly close to zero.” Claim 13 has been amended to recite, “z has a range from 0.0 to about 0.02.” Examiner further states that “it is unclear whether the amount of B must be necessarily finite, i.e., whether y must be greater than zero.” Claim 13 includes the limitation, “y has a range from about .01 to about 0.1.” Applicant therefore respectfully submits that claim 13 satisfies the requirement of definiteness and is allowable.

Claims 14-19

Claims 14-19 have been amended. Applicant submits that as currently amended, the claims are definite, and particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claims 20, 21

Regarding claim 20, the Examiner states that “it is unclear whether the antecedent basis of the phrase, ‘the metal is a metal combination,’ refers to the primary metal.” Claim 20 has been amended to include the phrase, “wherein the primary metal is a metal combination.”

Regarding claim 21, the Examiner states that, “it is unclear what is the antecedent basis of the phrase, the metal.” Claim 21 has been amended to replace the term “metal” with the term, “primary metal,” which has antecedent basis.

Regarding claims 20 and 21, the Examiner states that, “is it unclear whether each such metal of the metal combination must be present in finite amounts.” Applicant respectfully submits that there is no ambiguity in the claim as presented. For example, if the primary metal is a metal combination of cobalt-nickel, then some quantity of both cobalt and nickel must be present. The Examiner also asks, “must [each metal of the metal combination] be present in equal atomic amounts?” The Applicant responds that if each metal of the metal combination had to be present in equal atomic amounts, this would impose a limitation that does not appear in the claim. Therefore applicant respectfully responds that such a limitation should not be read into the claim.

For the above reasons, applicant respectfully submits that claims 20 and 21 are admissible.

Claim Rejections - 35 U.S.C. § 103

Claim 13

The Examiner has rejected claims 13, 18, 20, and 21 under 35 USC 103(a) as unpatentable over *Inoue et al.* (U.S. Patent No. 6,717,189).

Amended Claim 13 teaches:

An electroless plating structure on a metal-six copper (M6 Cu) pad, having a composition comprising:

$pM_w sM_x B_y P_z$

wherein pM is a primary metal selected from at least one of Cu, Ag, Au, Pd, Pt, Ni, Rh, and Ir;
wherein sM is a secondary metal selected from zero to at least one of Cr, Mo, W, Mn, Tc, and Re;
wherein B and P represent boron and phosphorus, respectively; and
wherein w has a range from about 0.5 to about 0.99, x has a range from about 0.0 to about 0.2, y has a range from about .01 to about 0.1, and z has a range from 0.0 to about 0.02.

Inoue does not teach the claimed elements of an electroless plating structure having a composition “wherein pM is a primary metal selected from at least one of Cu, Ag, Au, Pd, Pt, Ni, Rh, and Ir,” and “wherein sM is a secondary metal selected from zero to at least one of Cr, Mo, W, Mn, Tc, and Re.” *Inoue* teaches a protective film composed of an alloy film that is produced through electroless plating (*Inoue*, Col. 4, lines 44-49). The alloy film taught by *Inoue* is formed of cobalt and a refractory metal (*Inoue*, Col. 3, lines 38-56). Refractory metals consist of molybdenum (Mo), Tungsten (W), Tantalum (Ta), Rhenium (Re), and Niobium (Nb). *Inoue* also teaches alloy films that include Titanium (Ti). Therefore, *Inoue* fails to teach an electroless alloy that has the primary and secondary metals as claimed by applicant.

Applicants submit that amended claim 13 is patentable over *Inoue* and respectfully request withdrawal of the 35 USC 103(a) rejections.

Claims 18, 20, and 21

Given that claims 18, 20, and 21 depend from claim 13, applicants respectfully submit that claims 18, 20, and 21 are also patentable and respectfully request withdrawal of the 35 USC 103(a) rejections.

New Claim 31

Claim 31 teaches an electroless plating structures having a composition comprising Boron and Phosphor. *Inoue* does not teach the claimed elements of an electroless plating structure having a composition comprising both Boron and Phosphorus. *Inoue* teaches a protective film composed of an alloy film that is produced through electroless plating (*Inoue*,

Col. 4, lines 44-49). Inoue teaches that, “alloys containing Boron or phosphor are usable insofar as they contain no alkali metal.” (*Inoue*, Col. 6, lines 11-14). Therefore, *Inoue* fails to teach an electroless alloy that has both Boron and Phosphor.

Applicants respectfully submit that new claim 31 is patentable over *Inoue*.

New claim 35

Claim 35 teaches electroless plating structures having a composition comprising Cobalt and a secondary metal sM, wherein sM is selected from zero to at least one of Cu, Ag, Au, Pd, Pt, Ni, Rh, Ir, Cr, Mn, and Tc. *Inoue* does not teach the claimed elements of an electroless plating structure having a composition comprising Cobalt and a secondary metal selected from the above list. *Inoue* teaches a protective film composed of an alloy film that is produced through electroless plating (*Inoue*, Col. 4, lines 44-49). The alloy film taught by *Inoue* is formed of cobalt and a refractory metal (*Inoue*, Col. 3, lines 38-56). Refractory metals consist of molybdenum (Mo), Tungsten (W), Tantalum (Ta), Rhenium (Re), and Niobium (Nb). *Inoue* also teaches alloy films that include Titanium (Ti). Therefore, *Inoue* fails to teach an electroless alloy that has cobalt and secondary metals as claimed by applicant.

Applicants respectfully submit that new claim 35 is patentable over *Inoue*.

Conclusion

Applicant respectfully submits that in view of the amendments and discussion set forth herein, the applicable rejections have been overcome and the pending claims are in condition for allowance. If there are any additional charges, please charge Deposit Account No. 02-2666.

PETITION FOR EXTENSION OF TIME PURSUANT TO 37 C.F.R. § 1.136 (a)

Applicant respectfully petitions pursuant to 37 CFR 1.136(a) for a one month extension of time to file this response to the Office Action mailed September 16, 2005. The extended period is set to expire on November 16, 2005. A check in the amount of \$120.00 is enclosed to cover the fee for a one month extension of time.

Respectfully submitted,

BLAKELY, SOKOLOFF, TAYLOR & ZAFMAN

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